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Definition and Estimation of Private Sector Benefits*

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The purposes of this paper are to 1) discuss unresolved issues in the definition of private sector benefits, and 2) discuss alternative means of estimating private sector benefits in ex ante impact models. The reference model is the Shaffer and Tweeten (ST) model [10, see also 2, Ch. 13], which is designed to include a complete accounting of all private and public sector revenues and costs resulting from an employment changing activity. For both ex post research and ex ante applications of the ST and other related models, an alternative definition of private sector benefits which is directly related to an income measure of well-being is presented. The ST and alternative definitions yield potentially large differences in benefits.

The development of generalized estimation procedures for components of private sector benefits are important in ex ante applications to reduce the time consuming nature of the case study approach used in nearly all ex post research applications. Clayton and Whittington [1] have developed a model which uses default values for multipliers and other components needed to estimate benefits and costs. The estimation of reasonably accurate default values is a major research need.

Alternative Concepts of Private Sector Benefits

Social benefit-cost analysis refers to the evaluation of a public project from the national perspective where the definition and incidence of benefits and costs are in terms of national social welfare. This perspective accounts for the externalities and secondary effects generated by the project irrespective of geographic incidence.

Local community officials are motivated more by local than by national considerations. Mishan [6] suggests "there is nothing to prevent the economist from confining his calculation" to a certain geographic or organizational entity, as long as he makes this clear. Krutilla and Eckstein [5] imply that the choice of geographic perspective can be a function of the source of funds.

The ST model provides a conceptually complete accounting system for the benefits and costs of an employment changing activity at the local level (municipality, county, and multi-county region).[1/] It can be applied to either employment increasing or employment decreasing activities. Unresolved issues in the definition of private sector benefits are discussed in the context of an employment increasing activity, such as a new or expanding manufacturing plant.

In the ST model, private sector benefits consist of two components: primary or direct and secondary or indirect. Primary benefits can be further subdivided into benefits accruing to employees of the employment increasing activity and benefits accruing to those employed in the jobs vacated by these employees.

Primary Benefits: Employees

In the ST [10] model, direct benefits from an employment increasing activity are defined as the increase in consumption expenditures within the unit of analysis (municipality, county, etc.). For each employee

(1) $\Delta C_i = \Delta Y_i * APC_i$

where ΔC_i is the increase in consumption expenditures of the ith employee, ΔY_i is the change in income, and APC_i is the average propensity to consume

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[1/] Although ST do not consider environmental and social externalities, their model is sufficiently broad to incorporate them.

within the unit of analysis.[2/] The change in income is the difference between current income and income from a previous job or from unemployment compensation, adjusted for changes in social security taxes, state and federal taxes, and job related expenses such as commuting costs, union dues, or contributions to fringe benefits. Total primary benefits from employees in the ST model is the summation of equation (1) over all employees.

The underlying basis for the ST definition of primary benefits from employees is to represent the increase in income within the unit of analysis. The ST definition measures the change in income which is captured by local business and industry. However, the definition is not directly related to standard concepts of income or well-being. First, it does not measure the increase in income of local residents, but only that portion which is spent on consumption goods within the unit of analysis. Also, income spent by non-resident employees is a direct benefit under the ST definition. Second, it does not measure the direct increase in income to business and industry within the unit of analysis, but only the increase in sales. To obtain the increase in income, consumption expenditures must be adjusted for value added.

An alternative developed by Oakland, Sparrow, and Stettler [8] is to define primary benefits as the increase in income of local resident employees, i.e., $\Delta Y_i - \Delta LT_i$ for residents and zero for non-residents of the unit of analysis. The term ΔLT_i is the change in local taxes paid and is a transfer from the private to the public sector accounts. Since local government officials are concerned about balancing public sector budgets, it is probably preferable to include local taxes in the public accounts. However, there is

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[2/] Theoretically, the marginal propensity to consume is more appropriate. However, additional research is needed to estimate locally specific marginal propensities to consume.

a value added component to local businesses from increased consumption expenditures by non-resident employees. Local taxes paid by non-residents, such as municipal income (payroll) taxes, are also local benefits, but are included in the public sector accounts. With this alternative, primary benefits are defined as

$$(2) \quad PB_i = \begin{cases} \Delta Y_i - \Delta LT_i, & \text{resident employees} \\ \Delta VA_i, & \text{non-resident employees} \end{cases}$$

where PB_i is primary benefits of the ith employee, ΔVA_i is value added from consumption expenditures by the ith non-resident employee, and other terms are as previously defined. Total primary benefits from employees under the alternative definition is the summation of equation (2) over all employees.

Aside from distribution issues which are beyond the scope of this paper, the underlying basis for this definition is that the increased income of local residents is an appropriate measure of the increased well-being of a specified unit of analysis. Local residents, and through them the local unit, are better off by the total amount of increased income, and not only by that amount spent in the local community.

An additional issue in the definition of primary benefits from an employment increasing activity under the alternative definition is whether to treat employees who migrate into the unit of analysis as a result of the activity as resident or non-resident employees.[3/] Osman [9, see also 3 and 7] treated migrant employees as residents in his ex post study of manufacturing plants. About nine percent of the employees in his study migrated into the five county study area. In ST, about 12 percent migrated. Osman treated migrating

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[3/] In the ST definition, this is not at issue because additional consumption expenditures by residents and non-residents are included.

employees as residents because they had already moved to and become part of their respective local communities, and because no firm had a very large number of migrants in its labor force.

In ex ante and other ex post applications, the issue is more difficult. It depends on whether the unit of analysis is defined before or after the employment activity has occurred and on the proportion of migrants. Using Osman's approach, the higher is the proportion of migrants, the lower is the proportion of primary benefits attributable to the previous local residents. At the extreme, all primary benefits could be attributable to migrating employees. As the proportion of employees who migrate increases, the before vs. after definition of the unit of analysis becomes more critical. The definition also becomes more dependent on local value judgments about whether additional residents are beneficial or not. Computation of primary benefits under alternative definitions may be the best approach.

Osman [9, see also 3] compared primary benefits to employees from the ST and alternative definitions at the municipal or township level for seven of the eleven manufacturing plants in his study. The ST benefits are estimated using the ST definition in equation (1) and the alternative estimates using equation (2) except they do not adjust for changes in state and federal taxes and job related expenses. The alternative estimates do not include value added from non-resident employees. Employees who migrated to the municipality or township are treated as residents. The results (Table 1), expressed on a per employee basis, show that ST benefits range from 21 to 62 percent of benefits computed under the alternative formulation.

Primary Benefits: Vacated Jobs

Morse and Hushak [7] estimate primary benefits from refilling vacated jobs for the eleven manufacturing plants studied by Osman [9] at the five

Table 1. Annual Primary Benefits to Employees of Employment Activity: Shaffer-Tweeten vs. Alternative ($/Employee)

Firm No. (Employees)	Annual Primary Benefits		Percent ST of Alternative
	ST	Alternative	
1 (175)	411	1,533	27
2 (228)	1,204	2,105	57
3 (80)	575	1,311	44
4 (44)	885	1,460	61
5 (24)	1,464	2,358	62
6 (44)	2,099	3,397	62
7 (17)	177	831	21

SOURCE: Hushak and Osman [3]

county regional level. The estimates, using the alternative concept, vary from 10 to 120 percent of the benefits to employees of the employment activity. The conceptual issues in the definition of these benefits are the same as those discussed above, and are not repeated here. However, this is an area which abounds with opportunities to be misleading if sufficient empirical information is not available. The magnitude of error can be expected to increase rapidly as the size of the unit of analysis declines, i.e., from multi-county region, to county, to municipality or township.

Shaffer and Tweeten [10] asked employees who were previously employed whether or not their previous job had been refilled. If the previous job was located within the unit of analysis and was refilled, information on previous wage rates and local consumption behavior was used to estimate benefits on the basis of equation (1). However, considerably more information is needed. First, one wants to know whether a local resident obtained a previous job irrespective of where it is located. The smaller the unit of analysis, the more likely is the previous job to be located outside of the local area, and the more likely is that previous job to be refilled by a non-resident.

Second, if the person refilling the job is a resident, one needs to know his previous employment status to determine primary benefits and whether additional information is needed on a potential refilled job further down the chain. Although the additional information needs compared to ST are great, the danger of overestimating this component of benefits following ST is great, in particular where a large proportion of persons filling vacated jobs were previously on unemployment compensation or welfare.

Morse and Hushak [7] made a set of heroic assumptions about the total chain of re-employment events which take place from an employment increasing

activity for a five county region. For a region of this size, the assumptions appear reasonable. However, they do not provide estimates of primary benefits from vacated jobs at the county or sub-county levels because lack of information on the location of previous jobs and who refilled them made any plausible set of assumptions impossible. In sum, extreme caution is in order when attempting to estimate primary benefits from vacated jobs.

Secondary Benefits

In the ST [10] model, as well as Osman [9], Hushak and Osman [3], and Morse and Hushak [7], secondary benefits from an employment increasing activity are defined as

(3) $SB_i = \Delta C_i \ (M - 1)$

and

(4) $M = 1/(1 - ab)$,

where SB_i are secondary benefits from the ith employee, ΔC_i is additional local consumption as previously defined, M is a value-added multiplier, a is the value-added to sales ratio, and b is the local marginal or average propensity to consume.[4/] Shaffer and Tweeten [10] include additional consumption from vacated jobs which were refilled. Osman [9] does not because income from these jobs was not estimated. Total secondary benefits is the sum of equation (3) over all employees, including those filling vacated jobs.

Under the alternative concept of primary income benefits, an alternative definition of secondary benefits is

(5) $SB_i^* = PB_i \ (M - 1)$.

Since the value added multiplier adjusts for both value added and the average or marginal propensity to consume locally, this definition merits consideration.

[4/] See footnote 2.

A further issue is the timing of secondary benefits.[5/] In the ST and most related models, all secondary benefits are assumed to accrue beginning the first year. However, it may take several years before secondary effects are fully realized. Osman [9, see also 3 and 7] adopted an approach suggested by Johnson [4] for adjusting the multiplier,

(6) $M_t = (1 + d) - \frac{d}{25}(t - 5)^2$, $t = 0, \ldots, 5$,

where M_t is the multiplier in year t and d equals (M-1). In year 0, $M_t = 1$, and increases to $M_t = 1 + d$ in year 5 and remains at this level thereafter. Although Johnson's adjustment in equation (6) may not be ideal, secondary benefits do not occur immediately and an adjustment is needed.

Comparative results from Hushak and Osman [3] and Osman [9] are shown in Table 2. The first three columns compare secondary benefits using the ST model in equation (3) and the alternative in equation (5). The differences are proportional to the differences shown in Table 1 since the local multiplier for each manufacturing plant (M-1) is multiplied times primary benefits. The last three columns show the impact of assuming immediate secondary benefits as compared to using Johnson's equation (6). In the examples given, the present values assuming immediate secondary benefits are 21 percent greater than those using equation (6).

In sum, an alternative concept of primary benefits has been presented. The alternative which measures the increased income of the residents of a unit of analysis is directly derived from standard economic concepts of well-being. On this basis, it appears superior to the ST concept of primary benefits which is limited to consumption expenditures. It has also been suggested that

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5/ Parts of this discussion also need to be considered for income from vacated jobs which are refilled.

Table 2. Comparisons of Secondary Benefits: Annual Shaffer and Tweeten vs. The Alternative and Present Value Using Instantaneous vs. Johnson

Firm No.	ST vs. Alternative $/Employee			Present Value[a]		
	ST	Alternative	Percent ST of Alternative	Instant	Johnson	Percent Instant of Johnson
1	45	169	27	549	455	121
2	72	126	57	878	727	121
3	63	144	44	770	637	121
4	124	204	61	1,507	1,248	121
5	454	731	62	5,517	4,568	121
6	378	611	62	4,595	3,805	121
7	5	25	20	65	54	121

[a]The present values are computed using the annual values based on the ST model discounted over 20 years at six percent.

SOURCE: Computed from Hushak and Osman [3].

secondary benefits be estimated as the product of the alternative concept of primary benefits times the value-added multiplier, and that they be adjusted by a timing factor because they do not fully accrue during the first year. Finally, several pitfalls in attempts to estimate income from refilling vacated jobs have been pointed out.

Research Needs

The major unresolved conceptual issues, to this author at least, in the definition of private sector benefits have been discussed. Issues concerning the distribution of income and the definition of multipliers are addressed in other papers at this conference, and are not discussed here. These unresolved private sector benefit issues need further research and discussion because the usefulness of impact models depends upon their resolution.

This section focuses briefly on empirical research needs for the improved estimation of private sector benefits. While the discussion focuses on ex ante applications, much of the discussion is applicable to ex post applications as well. Nearly all applications of growth impact models are case studies, a large number of which are summarized by Summers et. al. [11]. While useful in their own right, these case studies provide relatively little information which can be used in the estimation of benefits in other cases. They do not use mutually consistent models and in many cases do not provide information needed to generalize results across studies. At the same time, these studies have not been analyzed with the objective of deriving generalizations about components of benefits which could be used as input in growth impact models.

The case study approach continues to be usable for application of impact models. However, the case study approach is time consuming. It may also be less desirable than generalized approaches in ex ante applications

because one is attempting to predict what will happen, and not to estimate what has happened. To reduce the time consuming nature of case study applications and to incorporate information on what has happened in other circumstances, cross-sectional econometric analysis of the components of private sector benefits is suggested. The objective of such research is to develop default or expected values of the components following Clayton and Whittington [1].

Both ST [10] and Osman [9] attempted to estimate the relationship between net benefits and community and firm characteristics. Besides the small sample problem they faced, this approach appears too aggregative because there are too many possible offsetting factors. Analysis of the disaggregated components of private sector benefits appears preferable. Included in the components as suggested by the conceptual discussion are:

(1) Expected residential status of new employees

(2) Expected wage rates of new employment activities

(3) Expected wage rates from previous or current employment activities

(4) Expected previous employment status

(5) Expected geographic and skill distribution of vacated jobs

(6) Expected average or marginal propensities to consume

(7) Expected value added multipliers.

Since these components must be specific to the unit of analysis, major control variables suggested are characteristics of the unit of analysis (country, for example) and of the employment activity (durable goods manufacturing, for example).

Some useful research can be done with secondary data, for example, the analysis of commuting for employment as it relates to county characteristics. However, the development of expected or default values for most components will require use of primary data. The current status of research knowledge

and suggestions for further research on these and other issues in applying growth impact models are the subject of other sessions of this conference. The task is large but so are the expected returns, not only for the applica- of growth impact models, but also for a better understanding of rural labor and employment behavior.

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